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EXAMINER	
CHANG, AUDREY Y	

ART UNIT	PAPER NUMBER
2872	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/529,574	DOBSCHAL ET AL.	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *06 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *25 and 27-59* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *25 and 27-59* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 March 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Remark

- This Office Action is in response to applicant's amendment filed on March 6, 2009, which has been entered into the file.
- By this amendment, the applicant has amended claims 25, 31, 37, 53, has canceled claim 26 and has newly added claims 54-59.
- Claims 25 and 27-59 remain pending in this application.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. **Claims 25, 27-52, 54, and 56-57 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 25 has been amended to include the phrase "main optics being chromatically corrected for an observation radiation". The specification however fails to teach how to achieve this chromatic correction for the observation radiation. While the specification teaches to use the diffractive element to chromatic correction for the inspection radiation, the specification never teaches the diffractive element is to also correct the chromatic aberration for the observation radiation. The remark filed on March 3, 2009 by the applicant also argues that the diffractive element is only to chromatic aberration for a limited wavelength range not an extended range, or wide wavelength range, (please see remark page 18, lines 8-10). So it is not clear how the chromatic aberration for the observation radiation, (which is different from the inspection radiation) is achieved. The claims therefore are not enabling by the specification.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 25 and 27-59 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 25 and 53 have been amended to include the phase "an inspection radiation that is used for autofocusing of an image... the observation radiation that is used to observe an object" that is confusing. Firstly, it is not clear what is considered to be the "image" and what is considered to be the "object". This makes the scopes of the claims very unclear. It is not clear if the image is related to the object or not. It is not clear how to interpret this image and this object, they are therefore being treated as *arbitrary* object and image. It is also not clear what is considered to be this "autofocusing" since the claims and the specification *fail* to define what is considered to be this "autofocusing", this phrase is therefore being interpreted as "focusing" of an arbitrary image. It is noted the claims fail to give a structural and logical relationships between the "observation radiation" and the "inspection radiation" in view of the cited "autofocusing of an image" and the "observation of an object" to definitely define the scopes of the claims.

Claim Objections

5. **Claims 53 and 55, 58 and 59 are objected to because of the following informalities**:

(1). The phrase "corrected for predetermined observation radiation" recited in claim 53 is confusing since it is not clear what is be corrected? (This objection has been set forth in the previous Office).

Appropriate correction is required.

Drawings

6. The drawings were received on March 6, 2009. These drawings are accepted.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 25-27, 36, 40-41 and 50-51 and newly added claims 54 and 56-57 are rejected under 35 U.S.C. 102(b) as being anticipated by the patent issued to Kashima (PN. 5,631,779).

Kashima teaches a lens system serves as the imaging optics that is comprised of main optics with a plurality of optical elements and a transmissive diffractive element (r12, Figure 1) for correcting chromatic aberration of the main optics by the diffractive effect of the diffractive element, (please see column 4, lines 8-10). Kashima teaches that the chromatic aberration can be corrected for radiation with wavelength from *ultraviolet* to *visible* or just the visible, (please see column 18, lines 22-44). This means if the inspective radiation is in *visible wavelength range* and the observation radiation is in the *ultraviolet* range, then the lens system can correct chromatic aberration for inspection radiation in *visible* range having wavelength different from the observation radiation (i.e. ultraviolet range).

Claim 25 has been amended to include the phrase the inspection radiation has a different longer wavelength than the observation radiation. The inspection radiation can be in the visible wavelength range which by definition is in the range of 380 nm to 750 nm, and the observation radiation is in the ultraviolet wavelength range which is in the range of 10 nm to 380 nm, this means that the inspection radiation has wavelength that is longer than the observation radiation.

Claim 25 has been amended to include the phrase "inspection radiation that is used for autofocusing an image" and the phrase "observation radiation is used to observe an object". These phrases are recitations concerning the manner of intended use. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Madham, 2 USPQ2d 1647 (1987). However, Kashima does teach that the objective lens system is used in a microscope, (please see column 1, lines 10-12) which implies that the observation radiation can be utilized to observe an object. It is also implicitly true that the objective lens can be used to form image for an inspection radiation (or any radiation for that matters since the image focusing is based on the refractive properties of the lenses).

Claim 25 has also been amended to include the phrase "the effect of the diffractive element does not substantially change the imaging properties of the aiming optics for the observation radiation". It is implicitly true that the diffractive element does not substantially change the imaging properties of the main optics for the observation radiation since the observation of the object can be achieved by the microscope.

With regard to claim 27, it is implicitly true that it is the non-zero order diffracted light that corrects the aberrations.

With regard to claim 36, Kashima teaches that the diffractive element is positioned on one side of plane-parallel plate.

With regard to claims 40 and 41, Kashima teaches that the diffractive element is blazed grating (please see Figure 30) and may have steps approximate the blazed profile, (please see Figure 31).

With regard to claims 50-51, Kashima teaches that the lens system can be made with the same material (please see Embodiment 6) or with maximum two materials (please see Embodiment 5).

With regard to claims 54, and 56-57, the inspective radiation can be in *visible wavelength range* and the observation radiation can be in the *ultraviolet* range, then the lens system can correct chromatic aberration for inspection radiation in *visible* range having wavelength different from the observation radiation (i.e. ultraviolet range). The difference between the wavelength between the inspection radiation (in the visible range 380-750 nm) and the observation radiation (in the ultraviolet radiation 10-380 nm) can be either 100 nm or 400 nm.

This reference has therefore anticipated the claims.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 28-29, 38 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Kashima.

The lens system taught by Kashima as described for claim 25 above has met all the limitations of the claims.

With regard to claims 28 and 29, this reference does not teach explicitly that the diffraction efficiency for the zero order of diffraction for the observation radiation is 80% and is greater than the sum of all other orders. However, it is known in the art to design the diffractive element to have desired diffraction efficiency for different diffraction orders, (i.e. this is done with respect to basic diffraction theory). It would then have been obvious to one skilled in the art to design the diffractive element with a

diffraction efficiency for the zero order diffraction light to be 80% and greater than the sum of all other orders so that the diffractive element can produce mainly zero order diffraction light as desired.

With regard to claim 38, it is an obvious modification to one skilled in the art to make the diffractive element positioned in the annular region for the benefit of making the lens system utilizes mainly the central annular portion of the radiation beam.

With regard to claim 42, it would have been obvious to one skilled in the art to arrange the diffractive element at the region that that the observation radiation has the greatest beam diameter for optimal operation.

11. Claims 31-35 and 52-53 and newly added claims 55 and 58-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Kashima in view of the patent issued to Omura (PN.6,903,803).

The lens system taught by Kashima as described for claim 25 above has met all the limitations of the claims.

With regard to claims 30-33, Kashima does not teach explicitly that the diffractive element is a phase grating with symmetry and has concentric annular depression. **Omura** in the same field of endeavor teaches a projection lens system wherein diffractive element is used for correcting aberration of the lens system. The diffractive element has annular depressions that form concentric rings and the rings or the annular depressions have a *rotational* symmetry with respect to the normal axis passes through the center of the diffractive element. It would then have been obvious to one skilled in the art to apply the teachings of Omura to modify the diffractive element to have the depressions be formed with concentric arrangement and has rotational symmetry for the benefit for the diffractive element to symmetrically diffract the light incident upon it.

With regard to claims 34 and 35, Kashima teaches that the depressions have same depth but it does not teach it may also have decreasing depth as radius from the center increases. However this feature is considered to be obvious matters of design choice to one skilled in the art. Since as the claims suggest the depth does not effect the aberration correction function of the diffractive element.

With regard to claim 52, Kashima does not teach explicitly that the lens elements are without cement. Omura teaches it is possible to make the lens system without cement. It would then have been obvious to one skilled in the art to make the lens system without cement to avoid possible noise introduces by the cement.

With regard to claim 53, as indicated by the Figure 11 of Omura the lens system is manufactured first with a design step. It is implicitly true that the lens elements and the diffractive optical element can be mathematically designed (i.e. using well known lens equation and the phase function of the diffractive element) so that the lens system achieve desired lens function. Omura teaches that the mathematical design data is used to actually manufacture the lens system.

Claim 53 has been amended to include the phrase the inspection radiation has a different longer wavelength than the observation radiation. The inspection radiation can be in the visible wavelength range which by definition is in the range of 380 nm to 750 nm, and the observation radiation is in the ultraviolet wavelength range which is in the range of 10 nm to 380 nm, this means that the inspection radiation has wavelength that is longer than the observation radiation.

Claim 53 has been amended to include the phrase "inspection radiation that is used for autofocusing an image" and the phrase "observation radiation is used to observe an object". These phrases are recitations concerning the manner of intended use. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Madham, 2 USPQ2d 1647 (1987). However, Kashima does teach that the objective lens system is used in

a microscope, (please see column 1, lines 10-12) which implies that the observation radiation can be utilized to observe an object. It is also implicitly true that the objective lens can be used to form image for an inspection radiation (or any radiation for that matters since the image focusing is based on the refractive properties of the lenses).

Claim 53 has also been amended to include the phrase "the effect of the diffractive element does not substantially change the imaging properties of the aiming optics for the observation radiation". It is implicitly true that the diffractive element does not substantially change the imaging properties of the main optics for the observation radiation since the observation of the object can be achieved by the microscope.

With regard to claims 55, and 58-59, the inspective radiation can be in *visible wavelength range* and the observation radiation can be in the *ultraviolet* range, then the lens system can correct chromatic aberration for inspection radiation in *visible* range having wavelength different from the observation radiation (i.e. ultraviolet range). The difference between the wavelength between the inspection radiation (in the visible range 380-750 nm) and the observation radiation (in the ultraviolet radiation 10-380 nm) can be either 100 nm or 400 nm.

12. Claims 37, 39 43-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Kashima in view of the patent issued to Ogawa et al (PN. 6,791,754).

The lens system taught by Kashima as described for claim 25 above has met all the limitations of the claims.

With regard to claims 37 and 48, Kashima teaches the lens system includes a diffractive element (such as r22 in Figure 1) may be formed at effective surface of the refractive lens element. Ogawa et al also teaches the diffractive element may be formed at optical surface of the refractive element, (please see

Figures 4 and 5). With regard to claim 39, it would have been obvious to one skilled in the art to arrange the diffractive element at the annular region of the refractive element to provide optimal operation.

With regard to claims 43 and 45, Kashima teaches the lens system may include a second diffractive element (such as r22 in Figure 1 and r14 in Figure 16) but it does not teach explicitly that the second diffractive element has diffraction enhancing and achromatizing effect. Ogawa et al teaches that the diffractive element in combination with refractive element can produce achromatizing effect, (please see column 1, lines 15-16). It would then have been obvious to apply the teachings of Ogawa et al to modify the second diffractive element in combination with the refractive element to have achromatizing effect to reduce the color effect.

With regard to claim 44, these references do not teach explicitly that the diffraction efficiency for the zero order of diffraction for the observation radiation is greater than the sum of all other orders. However, it is known in the art to design the diffractive element to have desired diffraction efficiency for different diffraction orders, (i.e. this is done with respect to basic diffraction theory). It would then have been obvious to one skilled in the art to design the second diffractive element with diffraction efficiency for the zero order diffraction light to be greater than the sum of all other orders so that the diffractive element to produce mainly zero order diffraction light as desired.

With regard to claims 46, 47 and 49, Kashima teaches that the second diffractive element may also be formed at surface of plane-parallel plate, (please see Figure 16). Although this reference does not teach explicitly that the first and second diffractive element are placed at opposite sides of the same plane-parallel plate or refractive optical element, such modification is considered obvious to make the system with more compact design.

Response to Arguments

13. Applicant's arguments filed on March 6, 2009 have been fully considered but they are not persuasive. The newly amended claims have been fully considered and are rejected for the reasons stated above.

14. In response to applicant's arguments which state that the specification page 1 lines 19-25 gives definitions for the "observation radiation" and the "inspection radiation" the examiner respectfully disagrees. Since the specification of the instant application only teaches that microscope as an **EXAMPLE** of the imaging optics but **fails** to disclose that the image optics is **defined** as the microscope with observation radiation for observing master wafer and the inspection radiation for autofocusing. In fact the specification never disclose any structure parts for supporting and definitively define the *microscope* for observing the master wafer and any optical arrangement for the "autofocusing" of an image of the inspection radiation to support and definitely define the "autofocusing" of the inspection radiation. The applicant is respectfully noted that an example is not considered as the definition.

15. In response to applicant's arguments which stated that the instant application is not like the cited Kashima reference to teach that the diffractive element to chromatic correcting a wide range of the wavelength. The examiner respectfully disagrees for the reasons stated below. Firstly the applicant is respectfully directed to column 18 lines 35 of Kashima that a single wavelength range such as the visible range is chromatically corrected. Secondly, the instant application teaches to chromatic correcting both the observation radiation and the inspection radiation that are of different wavelength ranges. However the specification completely fails to teach how the chromatic aberration in the observation radiation wavelength range is corrected. It is therefore very possible that the diffractive element also corrects the chromatic aberration for the observation radiation that makes the wavelength range corrected by the diffractive element is also extended. Furthermore, whether the diffractive element corrects a wide range

or a narrow range, as long as it corrects the chromatic aberration for the inspection radiation in the visible range, it reads on the instant application.

16. In response to applicant's arguments which state that cited Kashima reference does not teach that the diffractive element does not substantially change the imaging properties of the imaging optics for the observation radiation, the examiner respectfully disagrees for the reasons stated below. Since Kashima reference teaches that the objective lens is used in a microscope for observing object using the observation radiation or ultraviolet radiation, the imaging properties have to be not substantially changed by the effect of the diffractive element since the object is observed by the microscope.

17. In response to applicant's argument which states that the cited Kashima reference does not teach explicitly that it is the non-zero diffraction order to correct the aberration which therefore differs from the instant application, the examiner respectfully disagrees for the reasons stated below. The applicant being one skilled in the art must understand that the **reasons** that diffractive element can correct the aberrations of a refractive element (i.e. the imaging optics) is because that the **diffraction** (i.e. bending the light) of the incident light by the diffractive element is in the *reversed* direction, as function of the wavelength of the light, with respect to the bending of the light by the refractive element. The *reverse* bending of the light by the diffraction of the light (of course being non-zero diffraction orders) with respect to the bending of the light by the refractive element is the reason that the correction of the chromatic aberrations is achieved.

Conclusion

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing

date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (9:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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